

IN THE CLAIMS:

For the Examiner's convenience, all pending claims are provided below.

1. A diffractive optical element having a diffraction grating portion which includes first and second diffraction gratings, the improvement residing in that:

the first diffraction grating and an alignment pattern are formed on a first substrate and the second diffraction grating and an alignment pattern are formed on a second substrate, and that the first and second gratings are accumulated with an air space therebetween and the first and second diffraction gratings are positioned so that the alignment pattern on the first substrate engages the alignment pattern on the second substrate;

wherein the first and second diffraction gratings are formed on different materials such that a largest optical path difference to be applied to light rays passing through the diffraction grating portion with respect to each of plural wavelengths, becomes equal to a multiple, by an integral number, of the corresponding one of the plural wavelengths.

2. A diffractive optical element having a diffraction grating portion which includes first and second diffraction gratings, the improvement residing in that:

the first diffraction grating and an alignment pattern are formed on a first substrate and the second diffraction grating and an alignment pattern are formed on a second substrate, and that the first and second gratings are accumulated with an air space therebetween and the first and second diffraction gratings are positioned so that the

alignment pattern on the first substrate engages the alignment pattern on the second substrate;

wherein the first and second diffraction gratings are formed on different materials such that a largest optical path difference to be applied to light rays passing through the diffraction grating portion with respect to each of plural wavelengths becomes equal to a multiple, by an integral number, of the corresponding one of the plural wavelengths, and the alignment patterns are formed outside optically effective regions of the first and second diffraction gratings.

3. A diffractive optical element having a diffraction grating portion which includes first and second diffraction gratings, the improvement residing in that:

the first diffraction grating and an alignment pattern are formed on a first substrate and the second diffraction grating and an alignment pattern are formed on a second substrate, and that the first and second gratings are accumulated with an air space therebetween and the first and second diffraction gratings are positioned so that the alignment pattern on the first substrate engages the alignment pattern on the second substrate;

wherein the first and second diffraction gratings are formed on different materials such that a diffraction efficiency of diffraction light of a particular order, with respect to each of plural wavelengths, becomes equal to or nearly equal to 100%.

4. A diffractive optical element having a diffraction grating portion which includes first and second diffraction gratings, the improvement residing in that:

the first diffraction grating and an alignment pattern are formed on a first substrate and the second diffraction grating and an alignment pattern are formed on a second substrate, and that the first and second gratings are accumulated with an air space therebetween and the first and second diffraction gratings are positioned so that the alignment pattern on the first substrate engages the alignment pattern on the second substrate;

wherein the first and second diffraction gratings are formed on different materials such that a diffraction efficiency of diffraction light of a particular order, with respect to each of plural wavelengths, becomes equal to or nearly equal to 100%, and the alignment patterns are formed outside optically effective regions of the first and second diffraction gratings.

5. A diffractive optical element according to Claim 1, wherein the first and second diffraction gratings are disposed opposed to each other.

6. A diffractive optical element according to Claim 1, wherein the alignment patterns have a sectional shape of one of a triangular shape, a trapezoidal shape and a semi-circular shape.

7. A diffractive optical element having a diffraction grating portion which includes first and second diffraction gratings, the improvement residing in that:

the first diffraction grating and an alignment pattern are formed on a first substrate and the second diffraction grating and an alignment pattern are formed on a second substrate, and that the first and second gratings are accumulated with an air space therebetween and the first and second diffraction gratings are positioned so that the alignment pattern on the first substrate engages the alignment pattern on the second substrate,

wherein the alignment patterns have a sectional shape of one of a triangular shape, a trapezoidal shape and a semi-circular shape.

8. A diffractive optical element having a diffraction grating portion which includes first and second diffraction gratings, the improvement residing in that:

the first diffraction grating and an alignment pattern are formed on a first substrate and the second diffraction grating and an alignment pattern are formed on a second substrate, and that the first and second gratings are accumulated with an air space therebetween and the first and second diffraction gratings are positioned so that the alignment pattern on the first substrate engages the alignment pattern on the second substrate,

wherein the alignment patterns have a sectional shape of one of a triangular shape, a trapezoidal shape and a semi-circular shape, and the alignment patterns are formed outside optically effective regions of the diffraction gratings.

9. A method of manufacturing a diffractive optical element as recited in Claim 1, characterized by a process for fitting the alignment patterns of the first and second substrates together.

10. A method of manufacturing a diffractive optical element as recited in Claim 1, characterized by a process in which, after the first substrate is formed, the second substrate is formed by use of a mold, wherein the alignment pattern of the first substrate is fitted into the alignment pattern of the second substrate formed on the mold for the second substrate, whereby the first and second substrates are mutually positioned and molding of the second substrate is performed.

11. A method of manufacturing a diffractive optical element, comprising the steps of:

forming, upon a substrate, a first diffraction grating pattern and an alignment pattern;

preparing a mold having (i) an alignment pattern to be engaged with the alignment pattern formed on the substrate, and (ii) a second diffraction grating pattern; and

positioning the first diffraction grating pattern on the substrate and the second diffraction grating pattern to be spaced with respect to each other, across an air space, by engaging the alignment pattern of the substrate with the alignment pattern of the mold.